

belief in "the science of man's total living experience".²⁵ It perpetuates some of the fallacies of Social Darwinism by anticipating the structuring of future society. It may be superficial and a threat to excellence, or *ad hoc* learning, subject to the neuroses and vagaries of pressure groups inside or outside the universities. It may fail to achieve a deeper understanding of human life and society or detachment and insight, already threatened in Australian universities by self-centredness and lack of mobility.

Most solid knowledge has come from specialism, with strenuous training in one line and method of conceptual thought. The concept of limit is basic. It is possible to study only a limited amount in a limited way at one time. To make these limits appropriate and to find significant interconnections within a closed area is the challenge of the discipline. The scholar carefully feels where one discipline runs into another. He looks at the findings of relevant disciplines but he does not trespass beyond the areas of his own competence.

"Interdisciplinary studies" have been connected with "crisis" from Wallas in 1909 to the present day. I am not persuaded that the contemporary "crisis" is any worse than that of the Persian Wars for ancient Greece or the Black Death for the Middle Ages. There is also a polarising of issues into alternatives of choice between supposedly mutually exclusive opposites. Thus Brumeld saw the world at a perilous juncture between world-wide democracy or tyranny. In this sense "interdisciplinary studies" are the play-things of fashion. Both now and in the twenties the link was Environmental Studies; with Brumeld, Philosophy; with Mannheim, Sociology; with Jantsch, the Policy Sciences.

Conclusion

This paper does not discredit "interdisciplinary studies" as an educational experiment. It attempts to place them in proper perspective as revisionism of a tendency in the twenties and not as "the inevitable revolution" which they have been called. They are, I suggest, ONE answer to the educational problems in Australia, but not necessarily THE answer. There is, I believe, a strong case for strengthening existing disciplines, as recommended at the University of Wisconsin-Madison, while at the same time looking towards "interdisciplinary studies".²⁶ These seem to me to be particularly relevant to group-oriented postgraduate scholarship relating research more closely to society. In either case, I would like to see working experience in the community made a pre-requisite for both students and university staff.

BIBLIOGRAPHY

- * Merriam, Charles E. "Progress Report of the Committee on Political Research", *American Political Science Review*, XVII, May 1923, p. 284.
- * Merriam, Charles E. "The Present State of the Study of Politics", *American Political Science Review*, XV, May 1921, p. 184.
- * Ogg, Frederic A. "News and Notes", *American Political Science Review*, XVI, August 1922, p. 485.
- * Ortega Y. Gasset, Jose, *The Revolt of the Masses*, N.Y., Norton, 1932.
- * Crowell, John C. "University Reorganisation Through Environmental Studies", *Journal of Research and Development in Education*, 6, No. 1, Fall 1972.
- * Drucker, Peter. *Age of Discontinuity*, Lond., Heinemann, 1969. Toffler, Alvin. *Future Shock*, Lond., Pan Books, 1971. Boulding, Kenneth. *Design Education for the Future*, N.Y., pp. 199-213. Calder, Nigel. *The World in 1984*, Lond., Penguin.
- * Gross, Bertram M. "The Coming Era of Systemic Societal Change", *General Systems Bulletin*, 3, No. 1, May 1971, p. 12.
- * *Times Educational Supplement*, 11 June 1971, p. 4.
- * Arnoff, S. "Interdisciplinary Scholarship", *Peabody Journal of Education*, 48, October 1970, p. 42.
- * Jantsch, Erich. "Inter- and Transdisciplinary University: A Systems Approach to Education and Innovation", *Higher Education*, 1, Feb. 1972, p. 12.
- *Ibid.* pp. 15-16.
- * Brumeld, Theodore. *Ends and Means in Education*, N.Y., Harper & Bros., 1950.
- * Mannheim, Karl. *Diagnosis of Our Time*, Lond., Kegan Paul, 1943, p. 1.
- * Mannheim, Karl. *Essays on the Sociology of Culture*, Lond., Routledge, 1956, p. 206.
- * Mannheim, Karl. *Freedom, Power and Democratic Planning*, Lond., Routledge, 1951, p. 201.
- * Jantsch, Erich, *op. cit.* p. 27.
- * *Times Education Supplement*, 11 June, 1971, p. 4.
- * Gaff, Jerry and Wilson, Robert. "Faculty Cultures and Interdisciplinary Studies", *Journal of Higher Education*, XLII, No. 3, March 1971, p. 186.
- * Yudkin, Michael (ed.). *General Education*, Penguin Books, 1971, p. 197.
- * Trevor-Roper, Hugh. *The Spectator*, 14 July, 1973, p. 46.
- * Boyce-Gibson, A. *Muse and Thinker*, Pelican Books, 1972.
- * Yudkin, Michael, *op. cit.*, p. 28.
- * *General Studies Handbook*, University of New South Wales, 1973 and 1974.
- * Page, C. and Greenaway, Harriet (eds.). *Innovation in Higher Education*, Society of Research into Higher Education, 7th Annual Conference, London, 1971.
- * Jantsch, Erich, *op. cit.*, p. 34.
- * Rude, Eric. "New Graduate Programs and Structures", *Journal of Research and Development in Education*, 5, No. 4, Summer 1972.

BOUNDARIES BETWEEN DISCIPLINES OR BETWEEN DEPARTMENTS OR BETWEEN THINGS?

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ONE part of the difficulty in defining a discipline lies in the fact that its subject matter does not belong to it alone, but also to other disciplines. Three research students engaged in work on semi-conductors in three different Australian universities found

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themselves in the departments of physical chemistry, electrical engineering and physics respectively. In a fourth university, a geologist was investigating the same problems. Classifying disciplines baffles students. They want to know what skills they acquire, when they do the course leading to a degree in chemistry or physics or geology or engineering. They ask how one course differs from another and how it prepares them for a specific work. Answering that interests change and overlap from one university to another will not satisfy them any more than it ought to satisfy staff.

Experience provides the stuff of scientific problems. Yet there is no unambiguous way of relating the disciplines to experience. This difficulty applies to the social sciences as much as to the physical and biological sciences. Human geography finds common ground with sociology, physical geography with geology, while history and anthropology attempt to define communities in terms either of temporal sequences or cultural patterns. In our planning committees, we have come to accept overlapping courses.

The terms of the debate about curricula add to the difficulty by their vagueness. Take the words *new* and *old*; they seem almost interchangeable. Some members of older universities look enviously at new ones, where subjects like biomechanics or urban planning flourish. On the other hand, staff belonging to newer institutions may long to escape from departments offering courses like ergonomics and environmental studies, where they suspect the students learn no one thing thoroughly, and return to the familiar paths of their own undergraduate days. New subjects evolve in new institutions, but the time-span, to which all parties to the discussion implicitly refer, does not include more than a few generations. It does not give the debate a really historical tone, and sometimes the participants deny the relevance of history, for they maintain that the extent and rapidity of modern research have produced an entirely new situation.

Despite these widely held positions, we must give the discussion of the boundaries between the disciplines an historical tone. In addition, we must examine the ambiguities of experience and language.

Political Convention or Theoretical Discrimination?

When departments dispute about overlapping courses or compete for students, they often justify their positions by saying that their approaches differ. For example, the cultural geographer might answer that he examines the relation of man to his environment, whereas the sociologist deals more with attitudes and patterns of

behaviour in human groups. While the discussion ranges more deeply and broadly than this, its basis remains the assertion that different perspectives generate different subjects.

Some maintain that this assertion has a political flavour, while others say that it is theoretical. Two irreconcilable views of the university support these two positions.

The practical man takes the university as he finds it. He sees the institution serving a useful purpose and is impatient of debates about the idea of the university, which never reach a conclusion acceptable to all. He takes the existence of departments in a similar spirit. While he admits other ways of arranging courses, say in terms of schools rather than faculties and departments, he argues that flexible teachers and eager students can achieve any desired end, provided they set to it. Hence, he sees the university as an institution depending on a kind of social contract, like that which philosophers have made the basis of all human society. His approach is practical. He affirms that debate, agreement and action establish all human institutions, including academic ones. His idea of curricular planning is consistent with this. If human power provides the basis for the educational system, then planners have only to devise new structures and agree to set them in operation. Theory and practice in education consist merely in framing and testing hypothetical curricula.

Others see the problem as theoretical rather than practical. Broadly speaking, they deny that truth rests ultimately upon agreement. Instead, they regard it as an apprehension of a reality independent of convention. Proponents of this view maintain that experience exercises the decisive control upon investigation and that diversity of phenomena provides the basis for distinguishing disciplines.

Behind these two views of the university lie two quite different ways of relating experience and language and two radically different conceptions of reality. In fact, much more needs to be said about this problem, but these few remarks are enough to indicate the ambiguities of language and experience.

Methods and Sequential Order

We have spoken loosely of approaches to experience. Now we must make this term more precise. We can provisionally narrow the general term and call an approach a method. Then we can define a method as a way of structuring facts, i.e., of establishing sequences of particular and general propositions. In this sense of the word, a method is nothing more than an argument, which is a way of giving precise meaning to the verbal devices used in

general conversation. An argument changes a verbal device into a term (which has a precise meaning) by inserting it into a structure of meaning.¹

The problem now becomes one of describing different ways of establishing such structures. It is a difficult one to resolve fully, but we can distinguish two broad approaches consistent with what we have already written, which again indicate the unrecognised complexity of the debate about disciplines.

Firstly, structures of facts can be taken as arbitrary products of human activity. Designing new ones then depends upon the planners' ability to discriminate the perspectives of individuals or groups and of the past and the present. For example, biochemistry derives from biology and chemistry and economic history from history and economics. This approach coincides with what we have called the practical one above. Theory reduces to practice, since the intellectual structure only has value, if it is verified and verification is action. In this context, a successful course is one which attracts students.

The second approach does not see these intellectual structures as mere products of human creativity, but as somehow given. It seeks to reduce complex arguments to combinations of simple ones in somewhat the same way as Whitehead and Russell tried to reduce mathematics to logic, taking logic as the basic discipline. It is here that history helps our inquiry, because the European tradition abounds in examples of educational systems based on the acquirement of a definite, limited number of skills. For example, from Roman times to the Renaissance, thinkers distinguished in different ways between grammar (or the art of interpretation), rhetoric (or the art of communication), logic (or the art of proof) and dialectic (or the art of establishing premises). And all these arts were applicable to any part of the content of experience! Other sciences like mathematics, astronomy and music existed during these centuries. But the story is too complex and rich even to sketch. It is arguable that these arts are archaic. Some see them as architectonic, functioning in all modern intellectual activity either unnamed or under different names.² We may ask, whether our debate about the boundaries between the disciplines will gain by considering their history in greater depth and detail.

Interpretation or Order Within and Between Fields of Experience

Under the heading of method we have considered relations of order existing between propositions. But propositions can be taken as disordered aggregates and considered as such or singly in relation

to experience. Once again we meet compound ambiguity. We shall try to indicate its source in the same broad terms, which we have been forced to adopt for brevity's sake.

On the first level, experience presents itself as undifferentiated. For example, inhabitants of the coast of Melanesia link the flowering of trees and plants with the movement of the tides, the position of clouds and of the moon and stars and also with the habits of fish. Before ecology gained popularity in universities, the different schools of science would have made different parts of such experience the subjects of the separate sciences of botany, meteorology, astronomy and zoology. Historically, men have divided and united the sciences in many ways. Plato denied that a man could live nobly or with style unless he was virtuous and asserted that only the wise man could be good. What he united, his pupil Aristotle divided. Aristotle separated speculative sciences like physics and mathematics from practical sciences like ethics and politics (which had actions and decisions for their object) and both of these kinds of science from the productive sciences like painting and poetry. Truth, goodness and beauty demanded separate treatments. From then onwards, disciples or opponents have divided or united subject matters and sciences in various ways by narrowing or enlarging the field of experience to be treated. Boundaries between the disciplines properly appear, when investigators mark off either the data of one science from another or distinguish the results of one kind of research from another. Drawing this kind of boundary poses quite a different problem from that of defining methodologically the universal or particular arts, which we have mentioned above.

On the second level, even the facts of the separate sciences are ambiguous. Any one fact, like the registration of a temperature with a thermometer, can be taken as the demonstration of an objective reality or solely as the performance of a series of communicable operations. In the context of the physical sciences, Bridgman became the champion of the second approach to reality, but the debate between Einstein and Bohr at the Solvay Conference in 1927 about the observation of a photon passing through a gravitational field had raised the problem before that. And the issue had recurred centuries before the twentieth. The debates about the *Naturwissenschaften* and the *Geisteswissenschaften* of the nineteenth century in Europe also included the social sciences and the so-called humanities.

The Situation Within the Universities

At present, dialogue about curricula seems to have failed in

many universities. In its place there occur crossed monologues, in which the parties use the same verbal devices either without realising their ambiguity or, if they do recognise it, without possessing any technique for coping with it.³ Because verbal devices merely indicate the region of an argument and only become terms, when they have been inserted within a theoretical structure, the conduct of any fruitful dialogue demands that all the parties to a discussion remain aware that arguments can be established in many ways, each of which generates its own kind of meaning. Secondly, they must also accept different ways of interpreting any fact in somewhat the same way as the members of the United Nations keep to their working rules (if not to the prescriptions of their Charter), while accepting the basic ideological divergence of the other members and, therefore, the fundamentally different conceptions of what happens in the world.

Many discussions about reform in the universities ignore the history of education in Europe—to say nothing of China and India. Moreover, specialists tend to say that most of what is worthwhile in their discipline has been discovered within the last 50 years.

If history gives narrative unity to the facts, then men have written different kinds of history about education and use different species of fact as the stuff of history. Hence, educational reformists must resolve the existence of many accounts of what has happened by using the art of dialectic. Traditionally, dialectic aimed at holding in play a number of irreducible approaches to experience and to argument in order to draw out the richness and complexity of the problems it posed. Now, this art has been debased to controversy and limited to politics.

The absence of historical and dialectical awareness from the educational debate has rendered the universities political in a way that the student revolutionaries (who have tried to deal with the internal problems of their institutions in addition to their relations with other public corporations) have seen clearly.⁴ But few of those planning curricula show that they are conscious of the richness of the intellectual tradition. Nor do they introduce it creatively into the debate and into the design of new educational systems. Hence, the discussion never becomes dialogue, but breaks down and is replaced by academic dogmatism. Education takes on a monolithic character, not because goodwill is lacking, but because the members of the modern universities often lack that sense of the past that is necessary to recognise what is truly new and the interpretative and critical skills to make them truly operative in creating the new kind of education which an evolving society demands.

NOTES

¹ The word *verbal device* renders the Greek word *topos* and the Latin word *locus*, as they were used by rhetoricians and philosophers. Another translation would be *topic* or *place*. The ancients distinguished between devices or topics and terms. The former were vague, while the latter had a precise meaning given them by argument. For example, "Every systematic treatment of argumentation has two branches, one concerned with invention of arguments and the other with judgment of their validity; Aristotle was the founder of both in my opinion. The Stoics have worked in only one of the two fields. That is to say, they have followed diligently the ways of judgment by means of the science which they call . . . dialectic, but they have totally neglected the art which is called . . . topics, an art which is both more useful and certainly prior in the order of nature. For my part, I shall begin with the earlier, since both are useful in the highest degree, and I intend to follow up both, if I have the leisure. A comparison may help: It is easy to find things that are hidden if the hiding place is pointed out and marked; similarly, if we wish to track down some argument we ought to know the places or topics: for that is the name given by Aristotle to the "regions", as it were, from which arguments are drawn. Accordingly, we may define a topic as the region of an argument, and an argument as a course of reasoning which firmly establishes a matter about which there is some doubt." Cicero, *Topics*, II, 6-8.

² Cf. A. Ruhan, "Educating for the Professions", *The Australian Journal of Higher Education*, 1970, Vol. 4 (No. 1), pp. 49-56.

³ Cf. R. P. McKeon, *Freedom and History: the Semantics of Philosophical Controversies and Ideological Conflicts*, Noonday Press, New York, 1952.

⁴ Cf. *Crisis at Columbia*, the Cox Commission Report on the disturbances at Columbia University in April and May 1968, Vintage, New York, pp. 19-24. Cf. also the thoughtful analysis of Joseph J. Schwab, *College Curriculum and Student Protest*, University of Chicago Press, Chicago, 1969, Chapter 1, "Diagnoses", and Chapter 2, "Curricular Resources", and Chapter 4, "Curricular Prescriptions".

ACADEMIC LIBRARIES AND INTERDISCIPLINARY STUDIES—PROBLEMS WITHOUT SOLUTION

LA TROBE UNIVERSITY LIBRARY STAFF PAPER

THE current urge for interdisciplinary studies presents some problems for academic libraries which can be categorised under three headings: intellectual, administrative and financial. Though these three categories are not entirely unrelated it is important to keep them separate when discussing bibliographic services in relation to interdisciplinary studies.

It may be trite to restate that territorial claims in intellectual matters tend to become unrealistic in face of the continuous expansion of the boundaries of knowledge; yet it is all too often still firmly believed that a large number of academic subjects are hedged in by impenetrable borders. The many attempts at the classification of knowledge as represented in printed documents have to some considerable degree contributed to the belief that academic disciplines are, if not exactly self-sufficient, then at least largely autonomous and sacrosanct within their boundaries. The older types of library classification reflect this belief fairly strongly, but schemes developed in the 20th century have taken more notice of the overlapping and interdependence of many fields of academic